

U.S. Application 09/305,019

PATENT
Docket No. 10151

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Appellant: **Wieslaw J. Roth, et al.**

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Confirmation No.: 1528

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Serial No.: 09/305,019

Examiner: Tam M. Nguyen

For: **ALKYLAROMATICS
PRODUCTION**

Docket No.: 10151

CERTIFICATE OF MAILING UNDER 37 CFR 1.8

I hereby certify that the attached correspondence is being deposited with the United States Postal Service in an envelope with sufficient postage as first class mail and addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on May 10, 2004 by Tracy N. Keyes.

Tracy N. Keyes

APPELLANTS' BRIEF UNDER 37 CFR 1.192(a)

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Commissioner of Patents

PO Box 1450

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Sir:

Appellants appeal to the honorable Board of Patent Appeals and Interferences the Primary Examiner's final rejection of the claims set forth in the Office Action of Examiner Nguyen mailed September 9, 2003.

As required, the Appeal Brief is being filed in triplicate.

1. Real Party in Interest

The real party in interest is ExxonMobil Chemical Company.

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2. Related Appeals and Interferences

No appeals or interferences are known by Appellant, Appellant's legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

3. Status of Claims

Claims 4 to 12 are before the Board for consideration.

4. Status of amendments

No amendments after final rejection have been filed.

5. Summary of the Invention

The present invention relates to an alkylation/transalkylation process for preparing a monoalkylated compound from an alkylatable aromatic compound and an alkylating agent. Liquid phase alkylation/transalkylation processes are of increasing commercial importance since, by operating at lower temperatures, they result in lower yields of unwanted by-products. However, such liquid phase processes suffer from the problem that their lower operating temperatures increase the activity requirements of the catalyst particularly in the transalkylation step. According to the invention, it has now been found that small crystal (<0.5 micron), TEA-mordenite has unexpectedly high activity when used as a liquid phase transalkylation catalyst in a separate transalkylation reactor. In particular, small crystal TEA-mordenite exhibits unexpectedly higher activity as a liquid phase transalkylation catalyst than conventional TEA-mordenite as shown by Example 4 of the present application.

6. Issues

a. Did the Examiner err in rejecting claims 4-9 under 35 USC § 103 (a) as being unpatentable over Cheng et al. (U.S. Patent No. 5,557,024) in view of Kuchenmeister et al. (EP 0733608)?

b. Did the Examiner err in rejecting claim 10 under 35 USC § 103 (a) as being unpatentable over the references as applied to claim 4 above, and further in view of Innes et al. (U.S. Patent No. 4,891,458)?

c. Did the Examiner err in rejecting claims 11 and 12 under 35 USC § 103 (a) as being unpatentable over Cheng et al. (U.S. Patent No. 5,557,024) in view of Kuchenmeister et al. (EP 0733608) and Chu (U.S. Patent No. 3,766,093)?

7. Grouping of Claims

Claims 4-9 stand rejected under 35 USC § 103 (a) as being unpatentable over Cheng et al. (U.S. Patent No. 5,557,024) in view of Kuchenmeister et al. (EP 0733608). Claims 4-9 stand or fall together.

Claim 10 stands rejected under 35 USC § 103 (a) as being unpatentable over the references as applied to claim 4 above, and further in view of Innes et al. (U.S. Patent No. 4,891,458). Claim 10 recites that step (b) is conducted at a temperature of 100 to 260°C, a pressure of 10 to 50 barg, a weight hourly space velocity of 1 to 10 on total feed, and benzene/polyalkylated benzene weight ratio 1:1 to 6:1. Claim 10 stands separately from the remaining claims which are not so limited to reaction parameters.

Claims 11 and 12 stand rejected under 35 USC § 103 (a) as being unpatentable over Cheng et al. (U.S. Patent No. 5,557,024) in view of Kuchenmeister et al. (EP 0733608) and Chu (U.S. Patent No. 3,766,093). Claim 11, which recites TEA-mordenite was produced by crystallization from a synthesis mixture comprising a Si/Al₂ molar ratio of less than 90, stands separately from the remaining claims which are not so limited to a Si/Al₂ molar ratio. Claim 12, which recites TEA-mordenite was produced by crystallization from a synthesis mixture comprising a Si/Al₂ molar ratio of between about 35 and about 50, stands separately from the remaining claims which are not so limited to a Si/Al₂ molar ratio.

8. Arguments

A. Claims 4 to 9 have been finally rejected under 35 U.S.C. § 103 (a) as being obvious over Cheng et al. (U.S. Patent No. 5,557,024) in view of Kuchenmeister et al. (EP 733,608). With regard to Cheng et al, the Examiner argues as follows:

Cheng discloses alkylation and transalkylation processes in which a feed containing an aromatic compound (e.g., benzene) and olefins (e.g., ethylene) is contacted with MCM-56 or beta zeolite catalyst in an alkylation zone to produce monoalkylbenzene products such as ethylbenzene. By-products (e.g., polyalkylbenzene), which are produced in the alkylation step, can be recycled to the alkylation reactor to undergo transalkylation or they can be reacted with additional aromatic feed in a separate reactor in the presence of TEA-mordenite catalyst to produce monoalkylbenzene products. Cheng discloses reaction conditions for the alkylation step wherein the reaction takes place under liquid phase conditions at temperatures between 150 and 260°C and pressures up to 3000 psig in a space velocity of from 0.01 to 20 WHSV, based on ethylene feed. Cheng also indicates that the ratios of benzene to ethylene in the alkylation reactor may be from 1:1 to 30:1 molar. Cheng further discloses that the transalkylation zone is operated in a stoichiometric excess of aromatic compounds. Therefore, the ratio of benzene to polyalkylbenzene is greater than one. (See col. 3, lines 25-27; col. 5, lines 19-25; col. 6, lines 1-3; col. 12, line 10 through col. 14, line 40).

With regard to Kuchenmeister et al., the Examiner argues that:

Kuchenmeister discloses a transalkylation process of polyalkylbenzenes (e.g., polyethylbenzene) which are produced during the alkylation of benzene with olefins (e.g., ethylene) by using a crystalline aluminosilicate catalyst having an average particle size of

less than about 0.50 μm . The alkylation and transalkylation processes are conducted at a temperature between 250°C and 500°C, a pressure between 200 psi and 500 psi (1390-3447 kPa), at a WHSV from about 20 to 150 hr^{-1} , and a feeding ratio of benzene to ethylene from about 2:1 to 20:1. The reference discloses that the transalkylation process can be operated in a separate reactor. (See page 2 through page 3)

According to the Examiner it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Cheng et al. to use a TEA mordenite catalyst having an average particle size of less than 0.5 microns given the Kuchenmeister et al. teaching that improved transalkylation control in the production of ethylbenzene is attributable to the use of an aluminosilicate catalyst having a crystal size less than 0.5 microns. Appellants respectfully disagree with the Examiner and request the Board to consider the following arguments.

To support a rejection of a claim for *prima facie* obviousness under 35 U.S.C. § 103, the U.S. Patent and Trademark Office bears the initial burden to establish three elements: (a) that all of the elements recited in the claim are found or suggested in the prior art as a whole; (b) that there is some motivation, teaching, or suggestion for modifying the prior art to arrive at the claimed invention; and (c) that there is a reasonable expectation of success when making the modification. *See, for example, The Manual of Patent Examining Procedure* (“M.P.E.P.”), §§ 2142 through 2143.03. The teaching or suggestion to make the claimed modification and the reasonable expectation of success must both be found in the prior art, not in the patent applicant’s disclosure. *Id.*, and *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q. 2d 1438 (Fed. Cir. 1991).

As will be discussed below, Appellants respectfully submit that no *prima facie* case of obviousness has been established. In particular, Appellants submit that there is no motivation to combine the teachings of Kuchenmeister et al. with those of Cheng et al to arrive at the claimed invention. Further, if a *prima facie* case of obviousness has

been established, which it has not, then Appellants submit that they have rebutted that case with evidence of unexpected results.

Cheng et al, column 13, line 40 to column 14, line 44, teach a two step alkylation process, wherein an aromatic feed (benzene) is reacted with an olefin in the presence of an alkylation catalyst (such as MCM-56) in a first step to produce monoalkylated and polyalkylated product. In the second step, the polyalkylated product is reacted with additional aromatic feed (benzene) in the presence of "a suitable transalkylation catalyst" (column 14, line 27). "The transalkylation catalyst *may be* a catalyst comprising a zeolite *such as* MCM-49, MCM-22, PSH-3, SSZ-25, zeolite X, zeolite Y, zeolite beta, or mordenite," (emphasis added) including a TEA-mordenite (Cheng et al. column 14, lines 27-39). Cheng et al., however, do not set forth the particle size of their transalkylation catalyst, nor do they indicate any preference for the use of a TEA-mordenite. Referring to the claims for guidance with respect to preferences, as would be common for one of ordinary skill in the art, it is noted that dependant claim 3 lists MCM-22, zeolite X, zeolite Y, zeolite beta, and mordenite; dependant claims 6 and 9 require zeolite beta.

It is respectfully submitted that the Kuchenmeister et al. reference must be considered as a whole, and that the teaching of Kuchenmeister et al. is misconstrued by the Examiner's use of a single sentence separate from the context in which that sentence occurs. One of ordinary skill in the art would not have been taught what the Examiner is able to see with the advantage of hindsight.

At page 2, lines 12 to 28, Kuchenmeister et al, describe the problem being solved as *excessive production of polyalkylbenzenes at high temperatures and pressures associated with vapor phase reactions* (emphasis added). According to page 2, lines 25 to 28, in the case of ethylbenzene, the solution to this problem requires that the catalyst used in the *alkylation of benzene* with ethylene has *sufficient transalkylation activity* (emphasis added) to convert recycled polyalkylbenzenes at a

rate sufficient to maintain the volume of the recycled polyalkylbenzenes stream at a level within process capacity. At page 3, lines 19 and 20, Kuchenmeister et al. teach that "*the* catalyst" used in their invention is selective to the production of ethylbenzene at conditions of about 250 to about 500°C at pressures from about 200 to about 500 psi, giving no indication that such a catalyst would be expected to perform similarly under liquid phase conditions.

In other words, Kuchenmeister et al. teach that to avoid excessive production of polyalkylbenzenes in the vapor phase alkylation of benzene, the alkylation catalyst should have sufficient transalkylation activity to convert recycled polyalkylbenzenes. According to Kuchenmeister et al. this can be achieved by use of an aluminosilicate alkylation catalyst having a crystal size less than 0.50 μm . (See Kuchenmeister et al. at page 2, lines 39 and 30).

Cheng et al. state that the alkylation step of their two-step process can be carried out under either liquid or vapor phase conditions. It is therefore respectfully submitted that one of ordinary skill in the art, seeking to apply the teaching of Kuchenmeister et al. to the process of Cheng et al., would be led to expect that, if the alkylation step was performed in the vapor phase, then using an alkylation catalyst having a crystal size less than 0.50 μm would reduce the amount of polyalkylbenzenes to be removed in the second transalkylation step. There is absolutely nothing in the disclosures of Cheng et al. and Kuchenmeister et al. to lead one of ordinary skill in the art to expect that using a *transalkylation catalyst*, especially a TEA-mordenite transalkylation catalyst, having a crystal size less than 0.50 μm should have enhanced activity in a *liquid phase transalkylation* reaction.

To arrive at appellant's claimed invention by combining the disclosure in Kuchenmeister et al. with that in Cheng et al., one of ordinary skill in the art is required to make three separate choices which are either contrary to, or at the very least unsupported by, the teachings in the references, namely:

(i) The transalkylation step of Cheng et al. must be operated in the liquid phase despite the fact that there is no such instruction in Cheng et al. (the only references to liquid phase in Cheng et al. are directed to alkylation) and despite the fact that the disclosure in Kuchenmeister et al. is specific to vapor phase reactions.

(ii) The transalkylation step of Cheng et al. must be performed in a different reactor than the alkylation reactor despite the fact that in column 14, lines 20 to 24 Cheng et al. indicates that transalkylation can occur in either the alkylation reactor or a separate reactor and despite the fact that the disclosure in Kuchenmeister et al. is specific to an alkylation catalyst which has improved transalkylation activity.

(iii) The transalkylation step of Cheng et al. must be performed with a TEA-mordenite catalyst despite the fact that the claims of Cheng et al. suggest a preference for other materials and despite the fact that Kuchenmeister et al. teach that their transalkylation catalyst is primarily monoclinic aluminosilicate, whereas mordenite is wholly orthorhombic.

It is therefore respectfully submitted that there is no motivation, based on the disclosure in the references, to combine Kuchenmeister et al. and Cheng et al. to arrive at the claimed invention and hence that the claimed invention is not *prima facie* obvious.

In finding appellant's invention obvious, the Examiner relies on a statement at page 3, lines 29 and 30 of Kuchenmeister et al. According to the Examiner, this statement indicates "that improved transalkylation control in the production of ethylbenzene is attributable to the use of an aluminosilicate catalyst having a crystal size less than 0.5 microns". It is noted, however, that the relevant sentence in Kuchenmeister et al. reads as follows:

The improvement in transalkylation control of the *process of the present invention* is attributed to the use of an aluminosilicate catalyst having a crystal size less than about 0.50 μ m (0.50 microns) (emphasis added).

The "*process of the present invention*" has already at that point in the text been defined to include use of a catalyst which is effective at vapor phase conditions, is primarily monoclinic, and preferably has a Si/Al atomic ratio in the range of from about 50 to about 500 (page 3, lines 19 to 22 and 26 to 27). It is respectfully submitted that the context of the crystal size restriction would not have indicated to someone of ordinary skill in the art that the crystal size *alone* of the characteristics taught should be applied to a certain unrelated transalkylation catalyst. There is no recognition by Kuchenmeister et al. that optimizing particle size of TEA mordenite in a liquid phase transalkylation process would successfully yield the desired high activity result. On the contrary it is well known that different catalysts are generally used for vapor and liquid phase reactions because the reaction kinetics and catalyst activity are both affected by the pressure and temperature at which the reaction is occurring. Catalyst properties which improve the results of vapor phase reactions cannot, therefore, be presumed to have a similar effect with respect to liquid phase reactions.

It has long been established that catalysts are generally considered unpredictable merely from the chemical nature of the catalyst. [*Corona Co. v. Dovan* 276 U.S. 358, 369 (1928)]. Catalytic effects are not ordinarily predictable with certainty. *In re Doumani et al.* 281 F.2d 215, 126 U.S.P.Q. 408 (CCPA 1960). Further, the effect of the modification of one prior art catalytic process in a manner employed in another prior art process which employs a different catalyst was held unpredictable. [*Ex parte Berger et al.*, 108 U.S.P.Q. 236 (POBA 1952)]. To find obviousness, "there must be some reason for the combination other than the hind sight gleaned from the invention itself." *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q.

543, 551 (Fed. Cir. 1985). Stated in another way, “[I]t is impermissible to use the claimed invention as an instruction manual or ‘template’ to piece together the teachings of the prior art so that the claimed invention is rendered obvious.” *In re Fritch* 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992).

It is noted that there are a multitude of aluminosilicate catalysts and that Kuchenmeister et al. does not provide any enabling direction as to how to synthesize the catalyst they describe or even what aluminosilicate catalyst was actually tested. One skilled in the art would not have been likely to put much credence in the indefinite disclosures made. There is no presumptive correlation that two similar processes form substantially the same product where the processes differ by a materially limiting step. *Cf. In re Hoeksema*, 399 F.2d 269, 274, 158 U.S.P.Q. 596, 601 (CCPA 1968) (if the prior art of record failed to disclose a method for making a claimed compound, at the time the invention was made, it cannot be legally concluded that the compound itself was in the possession of the public).

Motivation is lacking when the state of the art at the time the invention was made pointed researchers in a different direction than the inventor proceeded. “Teaching away” is strong evidence of unobviousness, *In re Hedges*, 783 F.2d 1038, 1041, 228 U.S.P.Q. 685, 687 (Fed. Cir. 1986). Kuchenmeister et al. teach that their transalkylation catalyst is primarily monoclinic aluminosilicate, but can contain up to about 40% orthorhombic crystalline structure. Appellants submit that Kuchenmeister et al. teach away from the use of a mordenite catalyst, since mordenite has a wholly orthorhombic crystalline structure and Kuchenmeister et al. place an upper limit of 40% on the percentage of orthorhombic structure which can be contained in the catalyst of their invention. In this regard, the Board’s attention is directed to Meir and Olson, “Atlas of Zeolite Structure Types,” Appendix A, page 144 (Butterworth-Heinemann 1992). This teaching away makes it non-obvious to apply certain characteristics of the Kuchenmeister et al. disclosure and discard others.

Appellants submit that there is no *prima facie* case of obviousness because there is no motivation to combine the teachings of Cheng et al. with those of Kuchenmeister et al. As noted in the previously submitted second Declaration by Dr. Wieslaw J. Roth under 37 CFR 1.132, in Example 1 of Kuchenmeister et al., which employs an unspecified aluminosilicate catalyst having an average crystal size of 0.41 μ m, the diethylbenzene conversion rate after 1 day on stream is only 11% and that this rate decreases continuously with time on stream until, after 14.6 days, the diethylbenzene conversion rate is 2.8% (an aging rate of about 6%/day). In Comparative Example 1 of Kuchenmeister et al., which again employs an unspecified aluminosilicate catalyst but having an average crystal size of 0.70 μ m, the diethylbenzene conversion rate after 1 day on stream is even lower, at 4.6%, but this increases or remains generally constant until 6.7 days on stream. The data in Kuchenmeister et al. suggest that the unspecified aluminosilicate catalyst used therein has extremely low activity for diethylbenzene conversion irrespective of crystal size and that, in the case of at least the small crystal material, the catalyst ages rapidly. For both of these reasons, it would be counter-intuitive for one of ordinary skill in the art to consider the disclosure in Kuchenmeister et al. in seeking to improve the process of Cheng et al., particularly for a commercial application where long run times and hence low aging rates are critical.

If a *prima facie* case of obviousness has been established, which it has not, Appellants have rebutted that case with unexpected results achieved by the use of small crystal TEA-mordenite in the liquid phase transalkylation reaction. In this regard, the Board's attention is directed to the second Declaration by Dr. Wieslaw J. Roth under 37 CFR 1.132, which shows the results of testing comparing a catalyst made in accordance with the present invention and having a particle size of less than 0.5 micron with two commercially available mordenite catalysts also having a particle size of less than 0.5 micron.

Dr. Roth's first Declaration presented data showing that TEA-mordenite having an average crystal size of less than 0.5 micron is more active for the transalkylation of diisopropylbenzene than TEA-mordenite having an average crystal size of greater than 5 micron. These data were batch data generated in an autoclave and did not provide information as to the aging characteristics of the catalysts.

Table 1 of the second Declaration displays the results of a series of tests comparing the aging of the small crystal TEA-mordenite of the present invention with the aging of two commercially available, conventional mordenite catalysts. The tests were run for 7-14 days at a temperature of 260°C, a pressure of 500 psig, a benzene to polyethylated benzene weight ratio of 3:1 and a WHSV of 5. It will be seen from Table 1 that the small crystal TEA-mordenite of the present invention had an initial diethylbenzene (DEB) conversion activity of 77%, significantly and surprisingly higher than that of the Kuchenmeister et al. catalysts, but essentially the same as that of the conventional mordenite catalyst supplied by PQ Corporation. However, although each of the catalysts had a crystal size of below 0.5 μm , the small crystal TEA-mordenite of the present invention exhibited an aging rate significantly lower than either of the conventional mordenite catalysts. This surprising reduction of catalyst aging has significant commercial benefit.

The Examiner noted that the three catalysts shown in Table 1 of the second declaration had different silica alumina ratios, alpha values, and surface areas and stated that it was unclear if the aging rate was dependant on one or a combination of these variables. It is respectfully noted that the Appellants are not claiming a reduction in aging based on a specific variable, but have satisfied the requirement of showing that the claimed TEA-mordenite with a crystal size of less than 0.5 micron is surprisingly better than the 0.5 micron crystal size catalyst disclosed by Kuchenmeister et al. Appellants have further shown that even with respect to mordenite type catalysts, the 0.5 micron crystal size TEA-mordenite claimed in the

present invention is commercially advantageous over other forms of mordenite available in a small crystal size.

Accordingly, it is respectfully submitted that Cheng et al. and/or Kuchenmeister et al. fail to disclose or fairly suggest in any way the present invention as recited in claims 4 to 9. In view of this, reversal of the Examiner's final rejection by the Board of claims 4 to 9 under 35 U.S.C. 103 (a) is respectfully requested.

B. Claim 10 has been finally rejected under 35 U.S.C. § 103(a) as being obvious over Cheng et al. (U.S. Patent No. 5,557,024) in view of Kuchenmeister et al. (EP 733,608) and further in view of Innes et al. (U.S. Patent No. 4,891,458). The Examiner argues that Innes et al. discloses a transalkylation process, in the presence of a catalyst comprising zeolite beta, of polyalkylbenzene and an aromatic compound (e.g. benzene) in which the transalkylation process is operated at a molar ratio of aromatic hydrocarbon to polyalkylated aromatic hydrocarbon ranges from about 1:1 to about 50:1 and a pressure of 50 psig to 100 psig to maintain the process in the liquid phase. According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Kuchenmeister/Cheng process by operating the transalkylation step under the process conditions as taught by Innes et al. Appellants respectfully disagree with the Examiner and request the Board to consider the following arguments.

It is Appellants' position that this rejection fails for the same reasons as given above with respect to the rejection of claims 4 to 9, namely that there is no *prima facie* case of obviousness because there is no motivation to combine the teachings of Kuchenmeister et al. with those of Cheng et al. to arrive at the claimed invention. Moreover, the transalkylation of Innes et al. is conducted in the presence of a catalyst comprising zeolite beta, one of the preferred transalkylation catalysts employed by Cheng et al. Thus, it is respectfully submitted one of ordinary skill in the art seeking to combine the teaching of Innes et al. with those of Kuchenmeister et al. and Cheng et

al., would be led to employ zeolite beta as the transalkylation catalyst and not TEA mordenite required by Appellant's claims.

Accordingly, it is respectfully submitted that Cheng et al., Kuchenmeister et al., and/or Innes et al. fail to disclose or fairly suggest in any way the present invention as recited in claim 10. In view of this, reversal of the Examiner's final rejection by the Board of claim 10 under 35 U.S.C. 103 (a) is respectfully requested.

C. Claims 11 and 12 have been finally rejected under 35 U.S.C. § 103(a) as being obvious over Cheng et al. (U.S. Patent No. 5,557,024) in view of Kuchenmeister et al. (EP 733,608) and Chu (U.S. Patent No. 3,766,093). The Examiner argues that Chu discloses a mordenite catalyst having a $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio of 20-100($\text{Si}/\text{Al}_2=10-50$) and that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the process of Cheng et al. by using the TEA mordenite produced by the process of Chu. Appellants respectfully disagree with the Examiner and request the Board to consider the following arguments.

Instant claims 11 and 12 are dependent on instant claim 4 which recites TEA mordenite having an average crystal size of < 0.5 microns. As Appellants have previously pointed out, specifically on pages 6 and 7 of the Amended Appellant's Brief Under 37 CFR 1.192 (a), Cheng's TEA mordenite is synthesized according to the disclosure of U.S. Patent No. 3,766,093 (Chu). As shown by Example 3 on pages 8 and 9 of the present application, TEA mordenite produced according to the earlier Chu patent has a crystal size > 5 microns.

It is difficult if not impossible, to imagine how one skilled in the art in possession of the references could conceive the present invention without impermissibly picking and choosing among the various elements of the reference prohibited by the Court of Customs and Patent Appeals in *In re Wesslau*, 353 F.2d 238, 147 U.S.P.Q. 391 (C.C.P.A. 1965). The TEA mordenite of Chu while having a

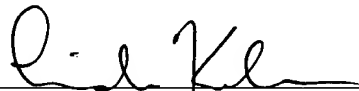
Si/Al₂ molar ratio of less than 90 has a crystal size > 5 microns. Accordingly, it is respectfully submitted that Cheng et al., Kuchenmeister et al., and/or Chu fail to disclose or fairly suggest in any way the present invention as recited in claims 11 and 12. In view of this, reversal of the Examiner's final rejection by the Board of claims 11 and 12 under 35 U.S.C. 103 (a) is respectfully requested.

9. Conclusion

Appellants respectfully submit that the foregoing arguments obviate all of the Examiner's final rejections in this case. The cited references neither disclose nor suggest the presently claimed invention. In view of this, reversal of these rejections by the Board is respectfully requested.

Respectfully submitted,

Date 5/10/04



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APPENDIX

CLAIMS

4. A process for producing a monoalkylated aromatic compound comprising the steps of:

(a) contacting an alkylatable aromatic compound with an alkylating agent in the presence of an alkylation catalyst in an alkylation reaction to provide a product comprising said monoalkylated aromatic compound and a polyalkylated aromatic compound, and then

(b) contacting the polyalkylated aromatic compound from step (a) with said alkylatable aromatic compound in the liquid phase and in the presence of a transalkylation catalyst in a transalkylation reactor separate from said alkylation reactor, said transalkylation catalyst comprising TEA-mordenite having an average crystal size of less than 0.5 micron to produce said monoalkylated aromatic compound.

5. The process of claim 4, wherein the alkylation step (a) is conducted in the liquid phase.

6. The process of claim 4, wherein the alkylating agent includes an alkylating aliphatic group having 1 to 5 carbon atoms.

7. The process of claim 4, wherein the alkylating agent is ethylene or propylene and the alkylatable aromatic compound is benzene.

8. The process of claim 4, wherein the alkylation catalyst of step (a) is selected from MCM-22, MCM-49, MCM-56 and zeolite beta.

9. The process of claim 4, wherein step (a) is conducted at a temperature between about 300° and 600°F (about 150° and 316°C), a pressure up to about 3000 psig (20875 kPa), a space velocity between about 0.1 and 20 WHSV, based on the ethylene feed, and a ratio of the benzene to the ethylene between about 1:1 and 30:1 molar.

10. The process of claim 4, wherein step (b) is conducted at a temperature of 100 to 260°C, a pressure of 10 to 50 barg, a weight hourly space velocity of 1 to 10 on total feed, and benzene/polyalkylated benzene weight ratio 1:1 to 6:1.

11. The process of claim 4, wherein the TEA-mordenite was produced by crystallization from a synthesis mixture comprising a Si/Al₂ molar ratio of less than 90.

12. The process of claim 4, wherein the TEA-mordenite was produced by crystallization from a synthesis mixture comprising a Si/Al₂ molar ratio of between about 35 and about 50.

TABLE OF CASES

1. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q. 2d 1438 (Fed. Cir. 1991).
2. *Corona Co. v. Dovan*, 276 U.S. 358, 369 (1928).
3. *In re Doumani et al.*, 281 F.2d 215, 126 U.S.P.Q. 408 (CCPA 1960).
4. *Ex parte Berger et al.*, 108 U.S.P.Q. 236 (POBA 1952).
5. *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q. 543, 551 (Fed. Cir. 1985).
6. *In re Fritch* 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992).
7. *In re Hoeksema*, 399 F.2d 269, 274, 158 U.S.P.Q. 596, 601 (CCPA 1968).
8. *In re Hedges*, 783 F.2d 1038, 1041, 228 U.S.P.Q. 685, 687 (Fed. Cir. 1986).
9. *In re Wesslau*, 353 F.2d 238, 147 U.S.P.Q. 391 (CCPA 1965)